SFY 2017

Remediation and Monitoring of Chlorinated Solvent At 314 Wendell Avenue and Vapor Intrusion Assessment at 308 Wendell Avenue Work Plan

314 Wendell Avenue

DRAFT FINAL

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ERM Project # 0227323

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

%...................... percent
µg/L................ micrograms per liter
µg/m³ .... micrograms per cubic meter
AAC................ Alaska Administrative Code
ADEC .... Alaska Department of Environmental Conservation
AOC................ Area of Accumulation
bgs.................. below ground surface
CAA................ central accumulation area
cDCE.............. *cis*-1,2-dichloroethene
COPC............. contaminant of potential concern
CRMP .... Chena River Monitoring Program
CSM .... conceptual site model
DCE................ dichloroethene
DW.................. depressurization well
ERM .... ERM Alaska, Inc.
ESL.................. ES Laundromat
FNACS .... Fairbanks Native Association Community Services
GCL................ groundwater cleanup levels
HS .... Hannah Solomon
IDW .... investigation derived waste
inWC.............. inches of water column
mL\min.......... milliliters per minute
OM&M .... operation, maintenance, and monitoring
PCE .... tetrachloroethene
PPE.................. personal protective equipment
QA/QC .... Quality Assurance/Quality Control
RAO................ remedial action objective
RCRA............. Resource Conservation and Recovery Act
SAA................. Satellite Accumulation Area
SCL.................. soil cleanup levels
SFY.................. State Fiscal Year
SSC.................. subsurface clearance
SSD.................. sub-slab depressurization
SVE .... soil vapor extraction
TCE .... trichloroethene
tDCE *trans*-1,2-dichloroethene
USEPA........... United States Environmental Protection Agency
VC .... vinyl chloride
VI..................... vapor intrusion
VMP............... vapor monitoring point

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1. INTRODUCTION

ERM Alaska, Inc. (ERM) has prepared this work plan addendum on behalf of the Alaska Department of Environmental Conservation (ADEC) to conduct an optimization evaluation and operation, maintenance and monitoring (OM&M) of the sub-slab depressurization (SSD) and soil vapor extraction (SVE) system at the ES Laundromat (ESL) building located at 314 Wendell Avenue, Fairbanks, Alaska, a vapor intrusion (VI) assessment of the adjacent Midnite Mine building located at 308 Wendell Avenue, and long-term groundwater monitoring (LTM). The scope of fieldwork described in this work plan is to be performed between September 2016 and July 2017. This work plan provides a description of the project objectives, project background, regulatory framework, conceptual site model (CSM), work to be performed, methodology, quality assurance (QA) and quality control (QC) plans, and a project schedule.

1.1. Project Objectives

Efforts to mitigate VI and to remediate vadose zone impacts in the chlorinated ethene source area at ESL have been performed since 2011. These efforts have resulted in mitigation of chlorinated ethene concentrations in indoor air and in soil gas beneath the building to below Alaska Department of Environmental Conservation (ADEC) target levels for commercial exposure while the SSD and SVE systems are operating. However, shutdown test monitoring results have shown that chlorinated ethene (specifically tetrachloroethene [PCE]) concentrations rebound above ADEC commercial target levels when the systems are turned off.

Previous characterization efforts have shown that nearby properties along the former sewer utility have the potential for VI, and access has recently been granted to perform a VI assessment of the Midnite Mine Building at 308 Wendell Avenue. Additionally, there is information that the Midnite Mine Building itself formerly housed a dry cleaning operation. Therefore, the scope of activities for State Fiscal Year (SFY) 2017 includes an optimization evaluation of the SSD/SVE system, a shutdown test of the system, OM&M of the optimized system, VI assessment at the Midnite Mine building, and LTM.

This work plan describes the methods by which the SFY 2017 work scope will be performed. The objectives of SFY 2017 are listed below:

- evaluate the remedial system to assess the contribution of each SVE and depressurization well (DW) to the overall system operation to optimize system operation for 2017;
- assess the extent of potential vapor intrusion risk (for both petroleum hydrocarbons and chlorinated ethenes) at the Midnite Mine building for comparison with ADEC VI target levels;
- operate, maintain, and monitor operation of the SSD/SVE system;

- compare soil gas chlorinated ethene concentrations to targets after a 7 or 8-month shutdown test of the SSD/SVE system; and
- evaluate current groundwater chlorinated ethene concentrations.

1.2. Project Background

1.2.1. Environmental Setting

The Site is situated on the collective floodplain of the Tanana and Chena rivers. The surficial geology consists of unconsolidated silt, sand and gravel of the Chena Alluvium. The Chena Alluvium is characterized by well-stratified layers of unconsolidated coarse sand and gravel, inter-bedded with poorly stratified layers and lenses of unconsolidated silt and sandy silt. The poorly stratified sediments are present in sinuous swale and slough deposits, while the unconsolidated coarse sand and gravel are ubiquitous within the Tanana-Chena floodplain. Collectively, these unconsolidated deposits are more than 300 feet thick in the Tanana and Chena River valleys (Péwé et al. 1976).

Discontinuous permafrost of generally low ice content is characteristic of Chena Alluvium sediments. However, swale and slough deposits commonly have moderate-to-high ice (permafrost) content in the form of seams and lenses. Where present, permafrost ranges in depth from 2 to 40 feet below ground surface (bgs) (Péwé et al. 1976).

The unconfined, alluvial-plain Chena Alluvium aquifer is capable of yielding significant quantities of water in wells. The aquifer may seasonally exhibit confined conditions in localized areas from seasonal frosts. Also, where discontinuous permafrost is present, confined conditions may exist in subpermafrost groundwater within the alluvial plain aquifer (Péwé et al. 1976).

Recharge to the alluvial-plain aquifer occurs from the Tanana and Chena rivers, with a relatively small amount resulting from infiltration of precipitation. Groundwater levels in the alluvial-plain aquifer respond relatively quickly to increases in the stages of the Tanana and Chena rivers. The Tanana River is primarily glacial-fed and is generally at its highest during peak summer, whereas the Chena River is generally at its highest during spring snowmelt and late-summer precipitation.

1.2.2. Previous Site Work

Investigation and characterization efforts have been conducted at the Site since 2001. Soil and groundwater characterization has continued since the initial investigations in 2008 in the vicinity of 314 Wendell Avenue. The horizontal and vertical extent of groundwater contamination was generally delineated between 2008 and 2010. These investigations have identified tetrachloroethylene (PCE) and its degradation products, trichloroethylene (TCE) and *cis*-1, 2-dichloroethylene (cDCE), in groundwater at concentrations above the ADEC GCL (Table 1) (OASIS 2009). During additional characterization activities in October 2009, April 2010 and June 2010, monitoring wells were installed at several depth intervals between the Wendell Avenue Site and the Chena River to characterize the groundwater plume horizontally and vertically (OASIS 2010a). Shallow ("S") wells are screened across the water table from approximately 10 to 15 feet or 20 feet below ground surface (bgs); medium ("M") wells are screened from approximately 20 to 30 feet bgs, and deep ("D") wells are screened from 35 to 40 feet bgs. Porewater samples were collected from the Chena River bank adjacent to the Wendell Avenue Site.

A detailed summary of the October 2008 through June 2010 characterization activities is presented in the Chena River Monitoring Plan (CRMP) (OASIS 2010b). Conclusions from the CRMP are briefly summarized in this section.

The source area is located near the ESL Building (Figure 2); the highest levels of groundwater contamination have historically been detected immediately west of ESL, at a maximum PCE concentration of 13,000 micrograms per liter (µg/L) in the shallow groundwater. Deeper samples exhibited only low levels of contamination, suggesting no evidence of a deep source. Three source area medium depth wells (25 to 30 feet bgs) results indicate that groundwater COPC contamination is primarily in the smear zone in the core of the source area. The primary contaminant in is PCE, with relatively lower concentrations of TCE and DCE.

In addition to the source area, PCE and TCE were detected in a 2002 soil gas investigation along the former sewer line to the east along Wendell Avenue. Several of the 2002 soil gas results exceeded the ADEC target levels for PCE and TCE. Some of these exceedances were located east of Dunkel Street.

The groundwater plume extends from the source area to the Chena River; however, the plume expands downward as it moves towards the river. Elevated contaminant concentrations were detected in shallow, medium and deep wells nearer the river, suggesting that contamination extends from near the water table to approximately 40 feet bgs.

Overall, these results indicate that the PCE is being degraded to DCE as it migrates across the Site. As groundwater approaches the Chena River, a majority of the PCE has been degraded to DCE. TCE has occasionally been detected in porewater samples and was above the GCL on one occasion. The further degradation of DCE to vinyl chloride (VC) and ethene has not been observed near the Chena River. Trend analyses performed for wells along the plume centerline indicate that the plume is declining to stable in the source area and is stable near the Chena River.

A SSD/SVE system was installed to mitigate VI into the ESL Building and remediate vadose zone soil in the source area around the ESL Building. The SSD/SVE system consists of six SSD wells, five SVE wells, a network of sub-slab soil gas and soil gas VMPs and an SSD/SVE system enclosure. Findings from the SFY 2012 and subsequent Wendell Avenue Site monitoring indicate that the SSD/SVE system is effectively mitigating VI at the Site. Vadose zone soil gas samples collected from the treatment area have decreased during system operation. SSD/SVE system exhaust stack PCE concentrations have decreased and become asymptotic during system operation. Results of periodic shutdown tests conducted in 2012 through 2016 indicate that soil gas chlorinated ethene concentrations are at least an order-of-magnitude lower than pre-remediation concentrations. However, shutdown test monitoring results have shown that chlorinated ethene (specifically PCE) concentrations rebound above ADEC commercial target levels when the systems are turned off.

1.3. Regulatory Framework

The primary COPCs at 314 Wendell Avenue Site are PCE and its potential degradation products TCE; 1, 1-DCE; cDCE; *trans*-1,2-dichlorehylene (tDCE); and VC. A regulatory framework for this project has been developed using the following regulations and guidance documents:

- ADEC, 18 Alaska Administrative Code (AAC) 75, Oil and Other Hazardous Substances Pollution Control, Revised as of 8 May 2016 (ADEC 2016);
- Vapor Intrusion Guidance for Contaminated Sites, October 2012 (ADEC 2012a).

Table 1 presents the maximum concentrations of COPCs detected in groundwater at the Site, the source area remedial action objectives (RAO) for active remediation, and the GCLs applicable to the Wendell Avenue Site to be achieved by monitored natural attenuation following active remediation.

TABLE 1: CONTAMINANTS OF POTENTIAL CONCERN

Compound	Maximum Groundwater Detection (µg/L), Location and Date	Groundwater VI Target Levels or Groundwater RAOs (µg/L) (ADEC 2012a)	Sub-Slab/Shallow Soil Gas VI Target Levels (Commercial/Residential) (µg/m³) (ADEC 2012a)	Groundwater Cleanup Levels 18 AAC 75.345, Table C (µg /L)
PCE	13,000 (MW-8S) [10/2008]	240	1,800 (420)	5
TCE*	610 (MW-8S) [10/2010]	22	88 (21)	5
1,1-DCE	1.14 (PP-1) [7/2002]	820	8,800 (2100)	7
cDCE	800 (MW-8S) [5/2011]	180	310 (73)	70
tDCE	82 (PP-1) [10/2008]	1,580	2,600 (630)	100
VC	ND	2.5	280 (16)	2

* - The TCE ADEC VI target levels and GCLs are expected to be lowered in response to IRIS Toxicity Profile for Trichloroethylene (United States Environmental Protection Agency ([USEPA] 2011)

$\mu g/m^3$ - microgram per cubic meter

ND – not detected

1.4. Conceptual Site Model

The current human health CSM scoping and graphical forms prepared for the Wendell Avenue Site are presented in Appendix A. The CSM is based on the following discussion of exposure media and routes. In late 2012, the ESL owners closed the business. However, the closing of ESL did not result in changes to the CSM.

1.4.1. Incidental Soil Ingestion

Historical soil sampling conducted in the Wendell Avenue Site area has shown concentrations of chlorinated ethenes exceeding soil cleanup levels (SCLs) listed in 18 AAC 75.341, Table B1, under 40-inch zone for soil between 0 and 15 feet bgs. Potential receptors to contamination from the incidental soil ingestion exposure route include:

- current and future residents;
- current and future commercial or industrial workers;
- current and future Site visitors, trespassers or recreational users; and
- current and future construction workers.

1.4.2. Ingestion of Groundwater

Historical groundwater sampling conducted in the Wendell Avenue Site area has shown concentrations of chlorinated ethenes exceeding the GCLs listed in 18 AAC 75.345, Table C. Although the shallow groundwater at the Wendell Avenue Site is not used as a source of drinking water, all groundwater in Alaska is considered a potential drinking water source unless determined otherwise using the criteria presented in 18 AAC 75.350. No groundwater determination has been completed for this Site under 18 AAC 75.350. There are no institutional controls currently in place to restrict or prevent the installation of a drinking water well. In addition, the municipal wells operated by Golden Heart Utilities are located approximately 1 kilometer in a cross gradient or upgradient direction from the Wendell Avenue Site. Potential receptors to contamination from the ingestion of groundwater exposure route include:

- current and future residents;
- current and future commercial or industrial workers;
- current and future Site visitors, trespassers or recreational users; and
- current and future construction workers.

1.4.3. Inhalation of Outdoor and Indoor Air

Historical soil sampling conducted at the Wendell Avenue Site area has shown concentrations of chlorinated ethenes exceeding the SCLs for soil between 0 and 15 feet bgs. VI sampling at the ESL Building and the Fairbanks Native Association Community

Services has shown concentrations of chlorinated ethenes in sub-slab soil gas samples exceeding the target levels for shallow or sub-slab soil gas. VI sampling has also shown concentrations of chlorinated ethenes in indoor air at the ESL Building, exceeding the ADEC target levels for indoor air. Operation of the SSD system has reduced sub-slab and indoor air concentrations of chlorinated ethenes in the ESL Building to below the ADEC target levels. However, continued monitoring will be needed to confirm that concentrations are consistently below target levels under differing operational scenarios. Potential receptors to contamination from the inhalation of outdoor and indoor air exposure routes include:

- current and future residents;
- current and future commercial or industrial workers;
- current and future Site visitors, trespassers or recreational users; and
- current and future construction workers.

1.4.4. *Inhalation of Volatile Compounds in Tap Water*

The presence of pumping wells in the Wendell Avenue Site area has not been determined. Therefore, it is assumed that they exist and could be used for indoor household purposes. Additionally, chlorinated ethenes for the Wendell Avenue Site are volatile. Potential receptors to contamination from the inhalation of volatile compounds in tap water exposure route include:

- current and future residents;
- current and future commercial or industrial workers;
- current and future Site visitors, trespassers or recreational users; and
- current and future construction workers.

1.4.5. *Surface Water/Sediment*

Groundwater sampling conducted at the Wendell Avenue Site and porewater sampling conducted on the south bank of the Chena River indicate that some chlorinated ethenes are present in groundwater that is hydrologically connected to the Chena River at concentrations exceeding a screening level of 1/10th the GCLs. Sediment samples collected from the Chena River bed contained concentrations of some chlorinated ethenes, exceeding screening benchmark values. Therefore, ingestion of surface water and direct contact with sediment are considered complete exposure routes. Potential receptors to contamination from the ingestion of surface water and direct contact with sediment exposure routes include:

- current and future residents;
- current and future commercial or industrial workers;
- current and future Site visitors, trespassers or recreational users; and

- current and future construction workers.

1.4.6. *Dermal Adsorption of Contaminants from Soil/Surface Water*

The COPCs at the Wendell Avenue Site have a limited potential for adsorption through the skin and are not listed in Appendix B of Policy Guidance on Developing Conceptual Site Models (ADEC 2010a). Therefore, the dermal adsorption exposure routes are not considered complete.

1.4.7. *Ingestion of Wild and Farmed Foods*

The COPCs at the Wendell Avenue Site have a limited potential to bioaccumulate and are not listed in Appendix C of Policy Guidance on Developing Conceptual Site Models (ADEC 2010a). Therefore, the ingestion of wild and farmed foods exposure route is not considered complete.

2. SCOPE OF WORK

The SFY 2017 scope of work includes the optimization of the SSD/SVE system, continued implementation of long-term OM&M of the SSD/SVE system, a VI assessment of the Midnite Mine building, and groundwater monitoring.

2.1. SSD/SVE System OM&M

ERM will perform quarterly SSD/SVE system OM&M inspections at ESL in September 2016 prior to system shutdown, in April or May 2017 after system restart, and in June 2017. OM&M inspections will be performed to verify operational status in accordance with established operational goals. A complete description of the SSD/SVE system and the operational goals is presented in the Remediation System Installation Report (OASIS 2011).

The OM&M inspections begin with the completion of OM&M data sheets (Appendix B). The OM&M data sheets are completed by reading the system meters and gauges and using a micromanometer. At a minimum, the following parameters will be recorded:

- SSD and SVE blower hour meter readings;
- System alarm status;
- Flow rate and vacuum from each DW and SVE well;
- Total flow from the SSD system effluent;
- Manifold vacuum level;
- Blower exhaust temperature;
- Moisture separator fluid level; and
- Vacuum readings from selected VMPs (Figure 4).

Filling out the OM&M data sheets will prompt the operator to perform maintenance tasks and identify where performance targets are not being achieved. The system will be balanced during OM&M visits to maximize contaminant removal by adjusting individual well flow rates to operational goals. After any system adjustments are performed, the final system conditions will be documented on the OM&M data sheets.

The June 2017 OM&M event will also include the collection of a remediation system effluent sample to measure concentrations of chlorinated ethenes. An air sample will be collected from the SSD/SVE system exhaust stack sample port to verify that emissions remain below regulatory thresholds triggering air quality concerns. The data from these samples will also verify that emissions continue to decline or remain at asymptotic levels. This data will be valuable for comparison with future results from rebound or shutdown testing of the SSD system.

2.2. SSD/SVE System Optimization Evaluation

To optimize operation of the SSD/SVE system, the contribution from each component of the SSD/SVE system will be evaluated individually. Note that parts of the ESL building may not be safe to enter (see HASP), so it may not be possible to evaluate every point. The following tasks will be completed in September 2016 in conjunction with the OM&M event:

- Collect vacuum and multi-gas readings from all subslab (SS) and nearby soil gas (SG) points (SG-2, SG-3, SG-7, and SG-8) and evaluate vacuum at DW-5, SS-10, and SS-11 if possible;
- Screen using Color-Tec all SVE and DW points (SVE-2,3,4,5, and 6 and DW-1,2,3,4,5, and 6) and collect one sample (plus a duplicate) for laboratory analysis from the point with the highest Color-Tec results; and
- Collect separate samples for laboratory analysis (chlorinated ethenes by Method TO-15) from both the SVE and SSD exhaust to compare the contribution from both parts. Because there are no separate SVE and SSD system exhaust sample ports, the sample will be collected by installing new taps into the piping.

Soil gas sampling techniques are described in Section 2.5. The Color-Tec screening manual is included in Appendix C.

2.3. Midnite Mine VI Assessment

ERM will perform a VI assessment of the adjacent Midnite Mine Building by completing the following tasks:

- In conjunction with the September SSD/SVE evaluation event at 314 Wendell, a building survey will be performed at the Midnite Mine Building, and three sub-slab sample points will be installed. The building survey will be documented using the building survey form included as Appendix D. The building survey results will be used to inform locations for the sub-slab sample points. The sub-slab sample point installation is described in Section 2.3.2.
- In October 2016 after approximately one month equilibration period, ERM will collect two indoor air samples (and one duplicate) and samples from the three sub-slab sample points installed during September and existing deep soil gas point SG-24. Indoor air samples will be analyzed for chlorinated ethenes and BTEX by EPA Method TO-15 SIM, and sub-slab points will be analyzed by EPA Method TO-15 (LL) and petroleum hydrocarbons (TPHg) by EPA Method TO-3.
- In June 2017 after approximately 1-2 months of optimized SSD/SVE system operation, ERM will collect two indoor air samples (and one duplicate) and samples from the three sub-slab sample points. Samples will be analyzed using the same methods used in October 2016.

Soil gas samples will be collected at three times during this project as outlined in the SFY 2017 Sample Summary presented as Table 2. Soil gas samples will be collected from VMPs using 30-minute flow controllers, a leak detection hood, and Summa® canisters. The laboratory analysis of soil gas samples is discussed in Section 3.6. Samples will be collected from soil gas and sub-slab VMPs as described in Section 2.5.

2.3.1. Property Access Agreements, Utility Locates and Permits

Property access agreements are in place for both 308 and 314 Wendell Avenue. Prior to installing the subslab sample points, ERM will complete a thorough utility locate process

Underground utility locates will be performed using any available information, the Alaska Digline, as well as a third party utility locate contractor

2.3.2. Sub-slab Sample Point Installation

The procedures of the sub-slab probe installation are as follows.

- Locate any sub-slab utilities following ERM subsurface clearance (SSC) procedures (Appendix E).
- Determine locations for three sub-slab sampling ports based on results of the building survey and avoiding sub-slab utilities. The sub-slab sampling ports should be located in areas most likely to encounter vapors, if known. At least one of the sample ports should be located near the western edge of the building closest to the ESL building. The field crew will discuss the proposed locations with the project manager prior to installation.
- Install three sub-slab sampling ports in the agreed-upon locations while avoiding any utilities present. Drill a 5/8-inch diameter hole through the concrete slab using a masonry bit and electric hammer drill. Take care not to disturb the soil beneath the slab. For flush mount installations drill a 1 ½-inch diameter hole at least 1 ¾-inches into the concrete slab.
- The sub-slab VMPs will be constructed using a Cox Colvin Vapor Pin™ consisting of a custom made vapor point and silicon sleeve (Appendix C). To install the VMP, ERM will brush out the hole with a bottle brush and use vacuum to remove loose particles. The Vapor Pin™ will be installed using a rubber mallet and Vapor Pin installation/extraction tool following detailed instructions provided in Appendix C.

2.3.3. Sub-Slab Sampling

Once the stainless steel sub-slab sample probe is in place and epoxy has cured, the sub-slab VMP will be sampled using the procedure described in Section 2.52.3.3.

TABLE 2: SFY 2017 SAMPLE SUMMARY

Anticipated Sampling Event Date	Build-ing	SSD/SVE System Operational Status	Sample Objectives	Sample Locations	Sample Number	Sample Type(s)	Sample QC	Purpose
September 2016 OM&M Sampling	ESL	SSD/SVE System on	SVE/SSD Optimization Evaluation	Separate Samples from SSD and SVE Exhaust	2	Exhaust Stack	None	Sample during SSD/SVE system operation from SSD and SVE separately (not using existing sample port) to evaluate contribution from 2 systems. Samples will be collected just prior to shutdown.
				Confirmation Sample from Highest Color-Tec Reading (SVE and DW points)	2	SVE or DW	Duplicate	Sample during SSD/SVE system operation to confirm Color-Tec screening result.
October 2016 Midnite Mine VI Investigation Sampling	MM	SSD/SVE System Shutdown	Evaluate Indoor Air	Indoor Air - Upstairs and Downstairs	3	Indoor Air	Duplicate	Following SSD/SVE system shutdown in September 2016 and one month of equilibration: sample indoor air, subslab soil gas, and deep soil gas at Midnite Mine.
	MM		Evaluate Subslab Concentrations	Three new subslab points	3	Sub-Slab Soil Gas	None	
	MM		Investigation Sampling - Soil Gas Plume Extents	SG-24	1	Deep Soil Gas	None	
April/May 2017 OM&M Sampling	ESL	SSD/SVE System Shutdown	OM&M	SS-4 (or alternative location if optimization study suggests otherwise)	2	Sub-Slab Soil Gas	Duplicate	Sample soil gas within influence of the SSD/SVE system after a 6 to 7- month shutdown test to assess steady-state magnitude of PCE and TCE soil gas plume.
June 2017OM&M and Midnite Mine VI Assessment Sampling	ESL	SSD/SVE System on	OM&M	SS-4 (or alternative location sampled in April/May) and RS-1	2	Sub-Slab Soil Gas and Exhaust Stack	None	Sample soil gas beneath ESL and in the exhaust stack to assess effectiveness of mitigation/remediation in source area and for comparison with previous active treatment samples to evaluate trends in contaminant reduction at the site.
	MM		Evaluate Indoor Air	Indoor Air - Upstairs and Downstairs	3	Indoor Air		Following SSD/SVE system restart in April/May 2017 and one month of equilibration: sample indoor air and subslab soil gas at Midnite Mine to evaluate conditions with the system operating.
	MM		Evaluate Subslab Concentrations	Three new subslab points	3	Sub-Slab Soil Gas		
March 2017 Groundwater Sampling	ESL	SSD/SVE System off	Evaluate Groundwater Plume	MW-6S, MW-7, MW-8SR, MW-9M, MW-12M, MW-4S, and MW-4M	7	Groundwater	Duplicate	Evaluate current groundwater concentrations (not sampled since 2014) and assess impact of SVE operation on groundwater plume

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2.4. SSD/SVE System Shutdown Test

A 7- or 8-month system shutdown test will be performed in SFY 2017 to assess the impacts of mitigation and remediation efforts since 2011. The shutdown test will be coordinated with soil gas efforts described in Section 2.2 to determine the degree to which system operation has decreased COPC concentrations below targets at steady-state soil gas conditions. The shutdown test will also provide information on whether system operation continues to mitigate VI at ESL and nearby properties.

The shutdown test will be accomplished by shutting down the SSD/SVE system in September 2016 and restarting optimized system in April or May 2017. The SSD/SVE system blowers, control panel, and main service breaker will be shut down in September. If the optimized system includes partial or complete operation of the SVE system, then it may be restarted in March or April 2017, in conjunction with the groundwater monitoring event, prior to the SSD system restart. The SVE startup will begin with turning on the main service breaker and energizing the heat trace on the SVE lines. The SVE system will be restarted and balanced at least 24 hours after the heat trace lines have been energized. The optimized SSD system will be restarted in late spring 2017 once seasonal freezing temperatures have passed.

2.5. Soil Gas Sampling Procedure

All sampling materials received from the lab will be inspected upon arrival to determine if the appropriate equipment has been provided and that all Summa® canisters have a minimum vacuum of 25 inches of mercury (inHg). Initial vacuum will be measured before sample collection using a high-quality gauge and will be recorded in the log book, on the tag accompanying the each canister, and on chain-of-custody (COC).

In the field, the initial step at each VMP is to check the differential pressure between the surface and sub-surface by connecting a digital manometer accurate to 0.001 inches water column (inWC) to the sub-slab monitoring point and recording the pressure/vacuum difference.

The next step involves leak detection for the sub-slab monitoring point. This process involves testing both the sample manifold and the sub-slab monitoring point for integrity. Figure 4 shows a schematic of a sub-slab sampling train. The following procedure will be used for conducting the manifold leak check:

- Check the initial vacuum in the Summa® canister that will be used for the sample. Ensure the Summa® canister valve remains closed unless sampling.
- Connect the sub-slab probe to the fitting under the leak detection hood using Teflon® tubing and Swagelok® compression-style fittings.
- Close the monitoring point valve under the hood.
- Remove the Summa® canister brass cap and attach the certified flow controller.

- Attach the manifold with vacuum gauge to the flow controller.
- Connect the leak detection hood to the manifold port without the pump valve using Teflon® tubing and Swagelok® compression-style fittings.
- Connect the pump valve side of the manifold to a peristaltic pump using polyethylene tubing.
- Use the peristaltic pump to pull a vacuum of approximately 15 inHg on the vacuum gauge. Vacuum will also be displayed on the flow controller.
- Close the pump valve and disconnect the tubing from the peristaltic pump.
- Verify the manifold maintains a steady vacuum. If the vacuum in the manifold does not decrease after one minute, then the manifold is considered leak-free. However, if the vacuum is decreasing in the manifold, check each connection and perform the manifold leak check again.

At this point, it is ensured that leaks do not exist between the Summa® canister valve and the monitoring point valve. A helium leak check will now be performed to ensure the integrity of the sub-slab probe seal and fittings between the probe and the monitoring point valve. The following process will be used for the helium leak check:

- Release the vacuum by opening the pump valve.
- Reconnect the tubing to the peristaltic pump.
- Connect the peristaltic pump to the rotameter using polyethylene tubing.
- Open the monitoring pump valve under the leak detection hood.
- Turn on the helium detector, let it complete the startup process, and connect it to one of the leak detection hood ports using polyethylene tubing.
- Connect the helium source to the other leak detection hood port using polyethylene tubing.
- Apply helium gas to the leak detection hood until 75 percent (%) helium concentration is displayed on the helium detector.
- Turn on the peristaltic pump. Verify that the flow rate is 200 milliliters per minute (mL/min) using the rotameter. Let it purge for 1 minute.
- After 1 minute, connect a Tedlar® bag to the rotameter outlet. Collect a sample in the Tedlar® bag for 10 minutes at 200 mL/min.
- Maintain a constant helium concentration of 75% in the hood during the 10-minute purge. Make a note in the field logbook if any vacuum is displayed while purging.
- At the completion of the purge, analyze the helium concentration of the air in the Tedlar® bag. A reading of less than 10% of the helium concentration measured in the leak detection hood is considered a successful leak check. A reading of more than

10% requires a re-test. Check the tightness of the under hood fittings. Hydrated bentonite may be applied around the sub-slab probe to provide an additional seal.

- Lastly, measure oxygen, carbon dioxide and total volatile hydrocarbons concentration in the Tedlar® bag using a multi-gas meter.

At this point, the sub-slab air sample may be collected. The following process will occur:

- Close the pump valve on the manifold and turn off the peristaltic pump.
- Open the valve on the Summa® canister and allow the canister to fill. Record the deployment date and time in the field book. Monitor the manifold vacuum gauge until the canister vacuum is reduced to 5 inHg or until 30 minutes have passed.
- Close the valve on the Summa® canister, disconnect the flow controller from the Summa® canister and replace the brass cap on the canister to reduce potential loss of vacuum. Record the final vacuum and retrieval date and time in the field book.

Prior to shipment of Summa® canisters to the laboratory, measure the final vacuum of each canister with a high quality gage to ensure a minimum 5 inHg remain. Record the final vacuum on the tag accompanying each canister and on the COC form. Complete the COC with all required information using the sample retrieval date and time.

2.6. Groundwater Monitoring

Groundwater samples will be collected from seven monitoring wells (MW-6S, MW-7, MW-8SR, MW-9M, MW-12M, MW-4S, and MW-4M) in late March or early April. The late March sample event is scheduled to coincide with the lowest seasonal groundwater levels and low Chena River stage and is consistent with timing of previous monitoring events. Figure 5 in Attachment A presents monitoring well locations to be sampled in SFY 2017. Data quality assurance/quality control and data quality objectives are discussed in the Quality Assurance Project Plan.

These seven wells will be sampled for chlorinated ethenes. Analysis will be performed by SGS Alaska, an ADEC-certified Lab.

A positive displacement pump will be used to implement the United States Environmental Protection Agency low-flow sampling protocols (Appendix C) in accordance with Section 5.2 of the CRMP (OASIS 2010). Following purging and water quality parameter stabilization, samples for chlorinated ethene analysis will be collected.

If absence of measurable groundwater or the presence of ice in monitoring well casings precludes any of the identified wells from being sampled, an alternate well(s) will be substituted with concurrence from the ADEC project manager.

2.7. Reporting

Data summary reports from the SFY2017 activities will be prepared to include OM&M data sheets, field notes, laboratory analytical results, and a quality assurance review and completed ADEC data review checklists. One data summary report will be prepared in

December 2016 to document the September SSD/SVE system evaluation and Midnite Mine VI assessment. This report will include recommendations for optimizing SSD/SVE system operation and for the June 2017 Midnite Mine VI sampling. The second data summary report will be prepared in June or July 2017 to document the groundwater monitoring event, system shutdown test, OM&M results, and May and June VI sampling at the ESL and Midnite Mine.

3. QUALITY ASSURANCE AND QUALITY CONTROL

The VI assessment and SSD/SVE OM&M project will be performed in accordance with the QA/QC procedures presented in this section. ERM professional staff will manage and execute the elements of this work plan. Jane Paris will be the project manager. Field efforts will be performed by several ERM engineers and scientists, each meeting the definition of "qualified person" as per 18 AAC 75.990(100).

3.1. Project Quality Assurance

Field personnel will collect samples in a manner that preserves the integrity of the sample matrix. Samplers will use certified sample media to prevent cross-contamination between samples. Sampling equipment will be dedicated to each sample location to the extent practical. Sample matrices will have minimal disturbance before collection. Sample containers will be sealed, labeled and preserved in accordance with the analytical method. All equipment will be calibrated, maintained and operated according to manufacturer recommendations.

3.2. Field Documentation

Field documentation will consist of the use of field logs, sample identification labels and photographs. A field logbook will be maintained by the ERM field team leader to record a description of field activities and samples collected. Corrections will be struck, initialed and dated. Information and observations relevant to monitoring activities will be recorded in the comments section of the appropriate forms and/or in the field logbook.

3.3. Sample Identification

Samples collected for laboratory analysis will be identified with a standard sample identification number format. Sample numbers will use the following format: 17-WAS-101-IA.

Where "17" represents the year; "WAS" represents "Wendell Avenue Site;" "101" is a sequential sample number; and "IA" is the designator for sample type. Possible sample types for this project are listed below.

- IA - indoor air
- SS - sub-slab air
- SG - soil gas
- ES - exhaust stack air

3.4. Sample Handling

Samples will be tracked by the use of COC laboratory forms. Each sample will be individually identified on a COC form. These forms will include the sample identification number, sample retrieval date, sample retrieval time, initial vacuum, final vacuum, requested analysis, type and number of sample containers, QC information, and requested analytical turnaround time. Each form will be signed and dated on relinquishment to another party, be it the shipper, courier or laboratory to maintain the custody the samples.

3.5. Investigation-Derived Waste

PCE-contaminated soil at 314 Wendell Avenue is classified as Resource Conservation and Recovery Act (RCRA) F-listed hazardous waste. The site is considered a small quantity generator with identification number AKR000203042. IDW expected to be generated during OM&M of the SSD/SVE system includes personal protective equipment (PPE). IDW expected to be generated during groundwater monitoring includes purge water. Solid and liquid waste will be segregated. IDW generated at the site will be stored in sealed buckets in the Satellite Accumulation Area (SAA) in the equipment room of the SSD/SVE system enclosure or in 55-gallon steel drums in the Central Accumulation Area (CAA). Emerald Alaska will be contacted for manifesting and transporting the waste to an approved treatment, storage, and disposal (TSD) facility. Wastes should be removed from the CAA within 270 days from initial placement in the CAA. IDW drums in the CAA will be inspected weekly and inspections will be documented in the field log book.

PPE includes items such as nitrile gloves, sample materials such as tubing and colorimetric tubes, condensate, rotameter wash water, spent filter cartridges and filter cake. IDW in the SAA will be transferred to the CAA before 55 gallons are accumulated.

3.6. Soil Gas Analytical Procedures

Soil gas samples will be analyzed using the EPA Method TO-15 low-level. SSD exhaust stack samples will be analyzed using the EPA Method TO-15. Indoor air samples will be analyzed using the EPA Method TO-15 selective ion monitoring (SIM). For the ESL building, samples will be analyzed for chlorinated ethenes. For the Midnite Mine VI assessment, samples will be analyzed for chlorinated ethenes and benzene, toluene, ethylbenzene, and xylenes (BTEX). Indoor air and soil gas samples will also be analyzed for petroleum using EPA Method TO-3. Table 3 presents the analytical program for each sample type.

Table 4 presents the estimated reporting limits for each COPC. Sample analysis of soil gas and sub-slab soil gas samples will be performed by Eurofins/Air Toxics of Folsom, California.

TABLE 3: SOIL GAS LABORATORY ANALYTICAL PROGRAM

Matrix	Analytical Method	Sample Container/Hold Time	Number of Primary Samples
ESL (314 Wendell)			
Soil Gas	EPA TO-15 low-level	6-liter Summa® canisters/30 days	4
SSD Exhaust Stack[1]	EPA TO-15	1-liter Summa® canisters/30 days	3
Midnite Mine (308 Wendell)			
Soil Gas	EPA TO-15 low-level for chlorinated ethenes & BTEX	6-liter Summa® canisters/30 days	7
Soil Gas	EPA TO-3 for TPHg	6-liter Summa® canisters/30 days	7
Indoor Air	EPA TO-15 SIM for chlorinated ethenes & BTEX	6-liter Summa® canisters (SIM certified)/30 days	4
Indoor Air	EPA TO-3 for TPHg	6-liter Summa® canisters/30 days	4

1 = Exhaust stack samples will only be collected during two of the OM&M events.

TABLE 4: ESTIMATED LABORATORY REPORTING LIMITS

Analyte	Estimated Reporting Limits – EPA TO-15 SIM (µg/m³)	Estimated Reporting Limits – EPA TO-15 low-level (µg/m³)	Estimated Reporting Limits EPA TO-15 (µg/m³)	Estimated Reporting Limits EPA TO-4 (µg/m³)
PCE	0.14	0.68	3.4	
TCE	0.11	0.54	2.7	
1,1-DCE	0.04	0.40	2.0	
cis-1,2 DCE	0.08	0.40	2.0	
trans-1,2 DCE	0.40	0.40	2.0	
VC	0.026	0.26	1.3	
Benzene				3.2
Toluene				3.8
Ethylbenzene				4.3
Xylenes				4.3
TPHg				103

3.7. Groundwater Analytical Procedures

Groundwater samples will be analyzed for chlorinated ethenes using EPA Method 8260B.

TABLE 5: GROUNDWATER LABORATORY REPORTING LIMITS

Parameter	Method	Primary Samples	Duplicates, MS/MSD, Trip Blank	Preservation	Bottle Type	Hold Time	Number of Bottles
PCE, TCE, cDCE,tDCE, VC	EPA 8260B	7	3	HCl, ph<2	40 mL VOA with Teflon seal	14 days	30 (3 per sample)

3.8. Quality Control Samples

QC procedures are used to ensure that data are useable for their intended purpose. Specific objectives of QC program are listed below:

- Samples collected at the site are consistent with project objectives;
- Samples are identified, preserved, and transported in a manner such that the data are representative of the actual site conditions;
- Information is not lost in sample transport; and
- The data are legally defensible.

Sampling will be performed in accordance with the methods described in Section 2.

QC samples will be collected and prepared to assess potential errors introduced during sample collection, handling and analyses. As part of the QA/QC program, field duplicate (QC) samples will be collected and analyzed.

Field duplicate samples will be collected to verify the reproducibility of data within the project laboratory. One soil gas field duplicate will be collected during each VI assessment sampling event, resulting in a QC frequency greater than 10%. Duplicate samples will not be collected for SSD/SVE system effluent samples. This equates to one field duplicate per VI assessment sampling event.

The duplicate samples will be handled, labeled, and documented in the same manner as regular field samples to prevent potential bias in the laboratory results. Field duplicates will not be identified but labeled in the same manner as other field samples on the chain-of-custody forms.

3.9. Data Quality Objectives

Analytical data quality objectives (DQO) have been established for this project to ensure that the monitoring data is of sufficient quantity and quality to accomplish the objectives listed below. The reporting limits for the individual samples may be affected by sample dilution caused by elevated target analyte concentrations. This effect shall be minimized to the extent practical by the laboratory during sample analysis. The contract laboratory will provide summaries of the air sample analyses and the associated QC samples for review and validation.

- Monitor PCE; TCE; 1,1-DCE; cis-1,2 DCE; trans-1,2 DCE; and VC for comparison with ADEC Vapor Intrusion Guidelines (ADEC 2012a);
- Evaluate the results of the site mitigation activities; and
- Ensure the integrity of the results is legally defensible.

The laboratory analytical DQOs accuracy, precision, completeness and reporting limits for the planned air sampling activities are as follows:

- Accuracy (Percent Recovery) – 70 to 130;
- Precision (Relative percent differences [RPD]) - < 30;
- Completeness (Percent) – 95; and
- Reporting Limit – below the Residential Sub-Slab Soil Gas Target Levels.

3.10. Data Reduction, Validation and Reporting

Verification of all analytical data will be performed by a qualified professional experienced in data verification/validation procedures. All data will be verified in accordance with the EPA procedural guidance documents and the ADEC regulatory guidance documents as appropriate. The reference documents include the EPA Environmental Data Verification and Validation EPA QA/G-8, November 2002; the EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA-540-R-08-01), June 2008; and the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA-540-R-10-011), January 2010.

Additionally, the data verification will conform to the ADEC Environmental Laboratory Data and Quality Assurance Requirements, Technical Memo-06-2002, dated March 2009 (ADEC 2009). Laboratory performance and analytical results will be checked through a QA review, which will include the ADEC Laboratory Data Review Checklist for Air Samples (ADEC 2012b). The review will assess analytical quality through five data quality indicators: completeness, accuracy, precision, comparability and representativeness. The impact of any discrepancies will be discussed with respect to the quality and usability of the data.

The following are DQOs for each indicator:

- Completeness – 95% of all samples collected should be analyzed.
- Accuracy – Percent recoveries of laboratory control samples, laboratory blank samples and surrogate recoveries in primary samples will be compared against laboratory control limits.

- Precision – Field and laboratory precision of samples will be measured through the collection and analysis of replicate samples. A replicate sample involves filling two canisters from the same air mass over the same period of time and is a measure of field precision. RPD for replicate samples should be less than 30%.
- Comparability – To compare data, samples will be analyzed for the same parameters using the same sampling and analytical methods. Reporting limits for samples should be less than the ADEC target levels presented in Table 1.
- Representativeness – Leak tests will be performed for samples to ensure that surface infiltration is not occurring. Air samples will be collected with Summa® canisters to capture air samples over the intended timeframe.

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4. SCHEDULE

Table 6 presents the estimated schedule for the project.

TABLE 6: PROJECT SCHEDULE

Activity	Estimated Date
SSD/SVE OM&M and System Evaluation	September 2016
SSD/SVE Shutdown	September 2016
Midnite Mine Building Survey and SS point installation	September 2016
Midnite Mine Soil Gas Sampling	October 2016
Groundwater Sampling	Late March 2017
SVE Startup & OM&M (if included in optimized system)	Late March 2017
SSD Startup and SSD/SVE OM&M	April or May 2017
Midnite Mine VI Assessment Sampling	June 2017
SSD/SVE OM&M	June 2017

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5. REFERENCES

Alaska Department of Environmental Conservation (ADEC) 2009. ADEC Environmental Laboratory Data and Quality Assurance Requirements, Technical Memo-06-2002, dated March 2009.

ADEC 2010a. Policy Guidance on Developing Conceptual Site Models. October.

ADEC 2010b. ADEC's Laboratory Data Review Checklist.

OASIS 2011. Remediation System Installation Report, 314 Wendell Avenue Site, Fairbanks, Alaska. November.

ADEC 2012a. Vapor Intrusion Guidance for Contaminated Sites. October.

ADEC 2012b. ADEC Laboratory Data Review Checklist for Air Samples.

ADEC 2016. 18 Alaska Administrative Code (AAC) 75, Oil and Other Hazardous Substances Pollution Control, Revised as of 08 May 2016.

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FIGURES

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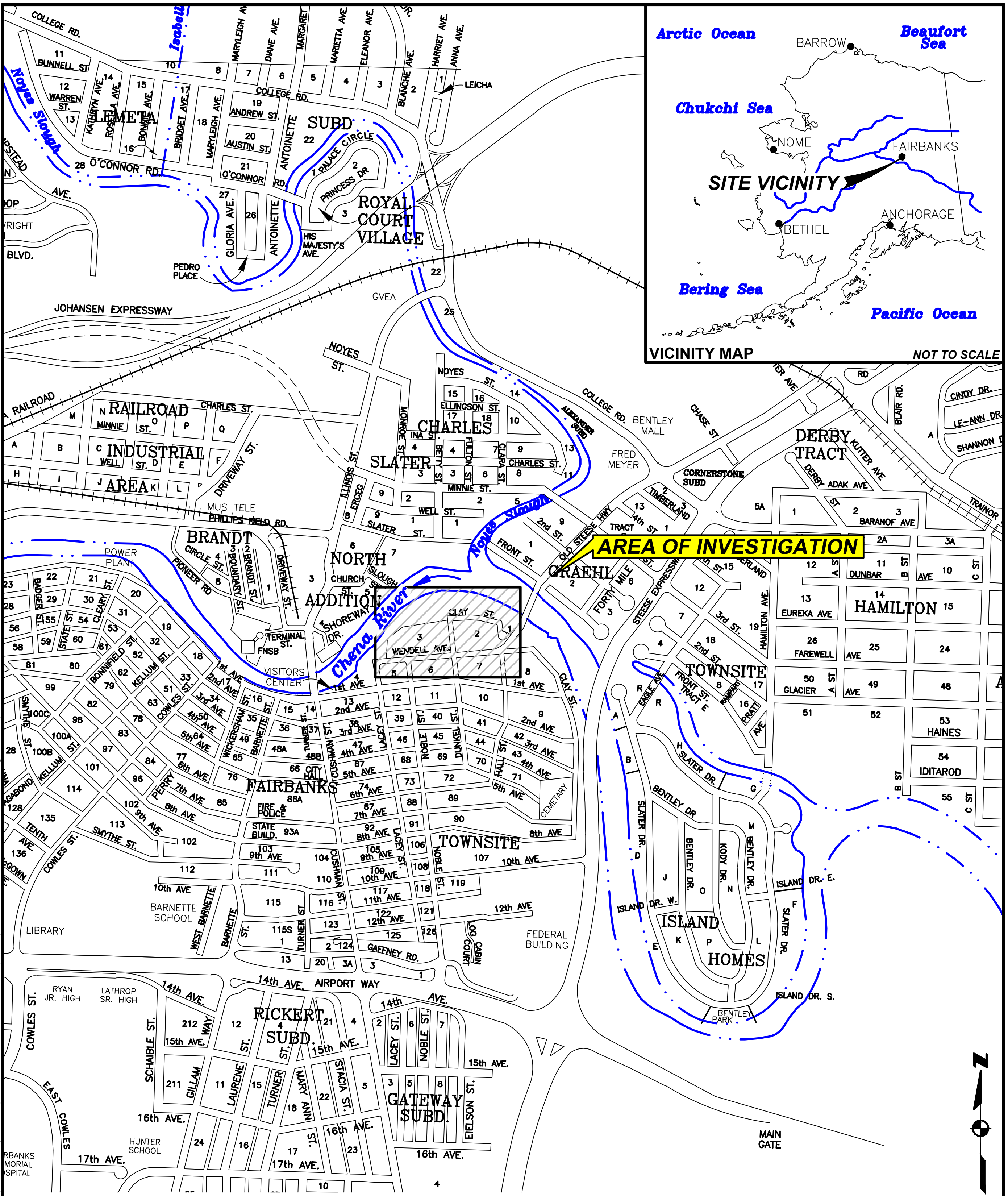


NOT TO SCALE

DATE: JULY 2015
CHKD: C.B.
DRAWN: M.L.B.
PROJ. No.: 0227323-3

ERM
825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

SITE LOCATION MAP

SFY 2017 REMEDIATION AND MONITORING OF CHLORINATED SOLVENT AT 314 WENDELL
WORK PLAN
WENDELL AVENUE SITE
Fairbanks, Alaska

FIGURE
1

SOURCE: CITY MAP.DWG PROVIDED BY THE NORTH STAR WEB SITE. DATE UNKNOWN.

wdancdc01\Data\Team\DMMV\CAD\0227323-Wendell\03\0227323-04_01_A.dwg Sep 27, 2016.

FIGURE 2

WENDELL AVENUE 2016
PROPOSED SAMPLING LOCATIONS
SFY 2017 VAPOR INTRUSION ASSESSMENT
AND SSD/SVE SYSTEM OM&M WORK PLAN
WENDELL AVENUE SITE
Fairbanks, Alaska

DATE: JULY 2015
CHKD: C.B.
DRAWN: M.L.B.
PROJ. No.: 0227323

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

ERM

Y:\Team\DMMV\CAD\0227323-Wendell\03\REPORT\0227323-03_04_B.dwg Sep 29, 2016.

SOURCE: AERIAL PHOTO AERIAL.JPG DATED 7/29/15 PROVIDED BY BING MAPS.

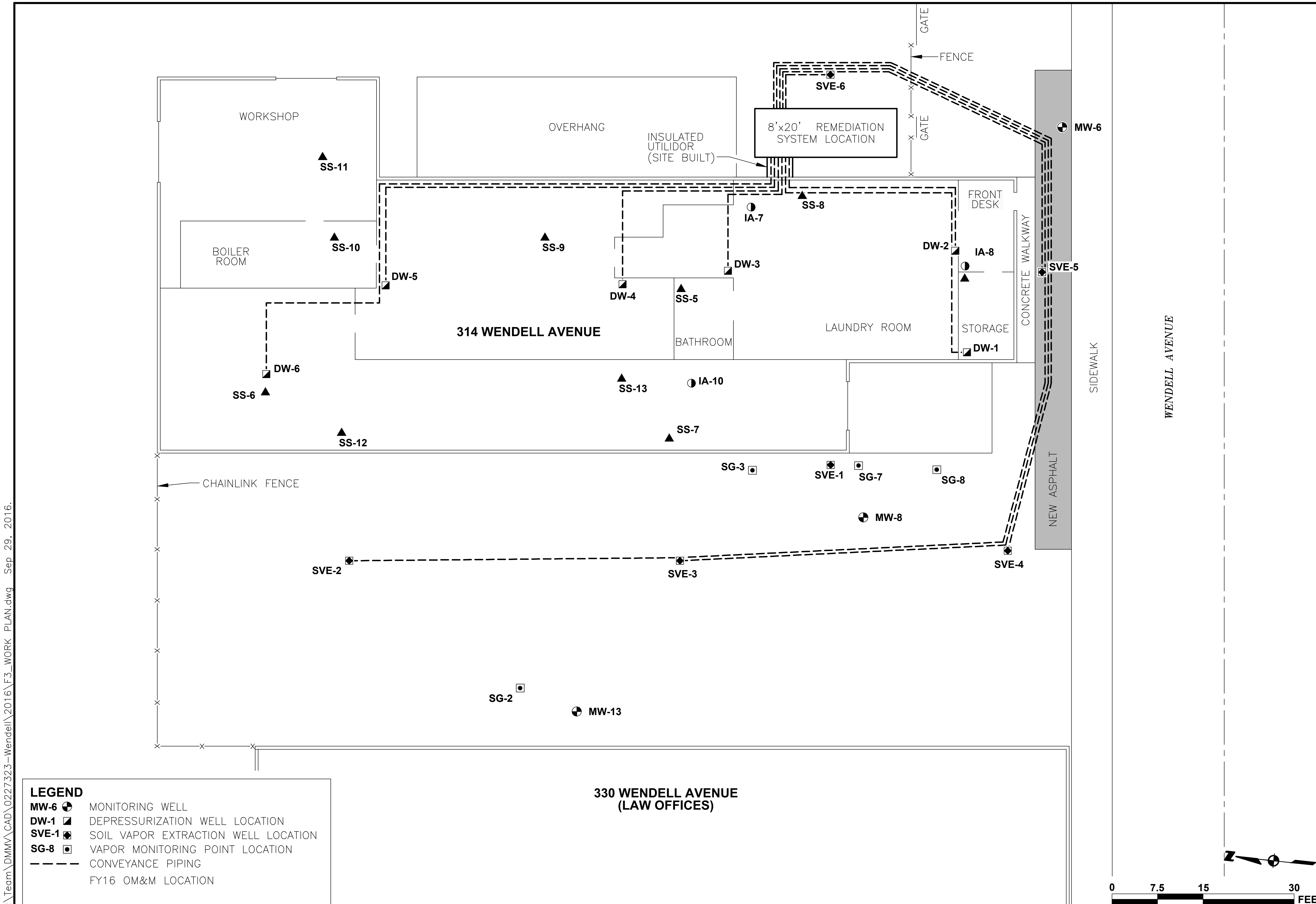


FIGURE 3

SSD/SVE SYSTEM PLAN VIEW WITH MONITORING LOCATIONS

SFY 2017 VAPOR INTRUSION ASSESSMENT AND SSD/SVE OM&M WORK PLAN
WENDELL AVENUE SITE
Fairbanks, Alaska

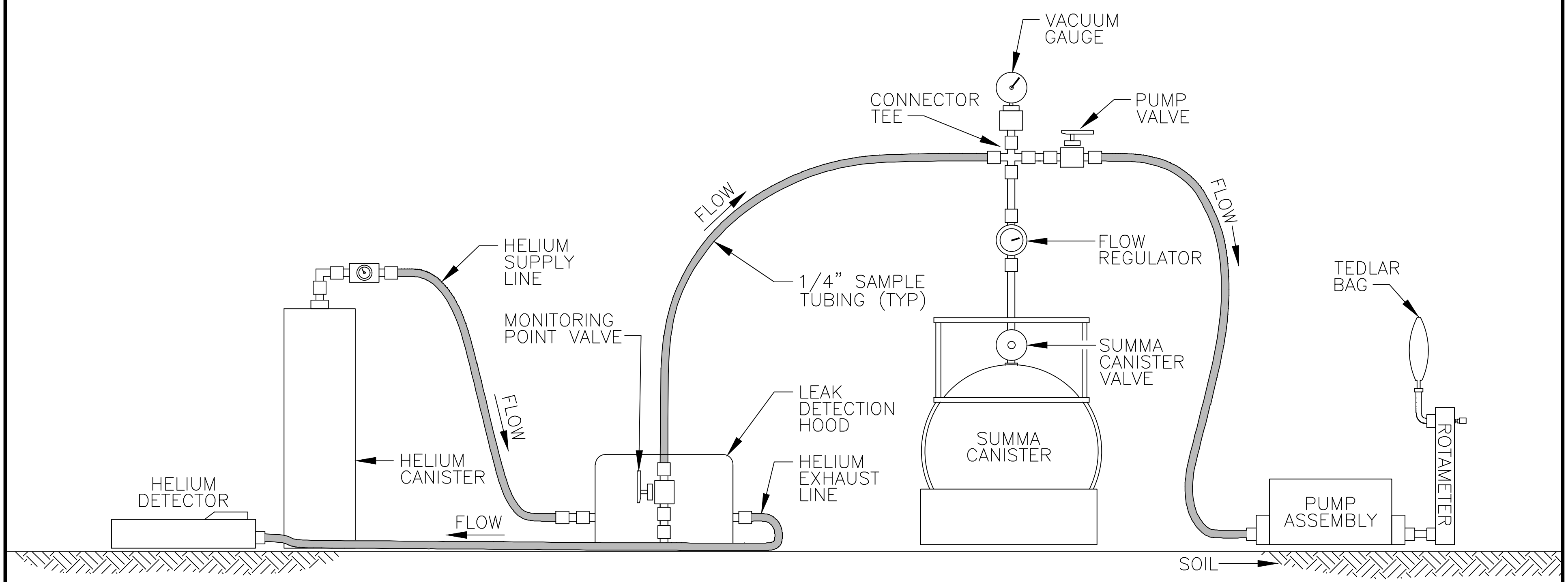
DATE: JULY 2016
CHKD: N.B.B
DRAWN: N.B.B
PROJ. No.: 0227323

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

ERM

Y:\Team\DMMV\CAD\0227323-Wendell\2016\F3_WORK PLAN.dwg Sep 29, 2016.

Y:\Team\DMMV\CAD\ANIAK\2013\WORK PLAN\0191259-WP_F4.dwg Sep 27, 2016.



NOT TO SCALE

ERM

DATE: SEPT 2016
CHKD: C.T.B.
DRAWN: D.R.F.
PROJ. No.: 0227323
825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

LEAK DETECTION SCHEMATIC

SFY 2017 VAPOR INTRUSION ASSESSMENT AND SSD/SVE OM&M
OM&M WORK PLAN
WENDELL AVENUE SITE
Fairbanks, Alaska

FIGURE
4

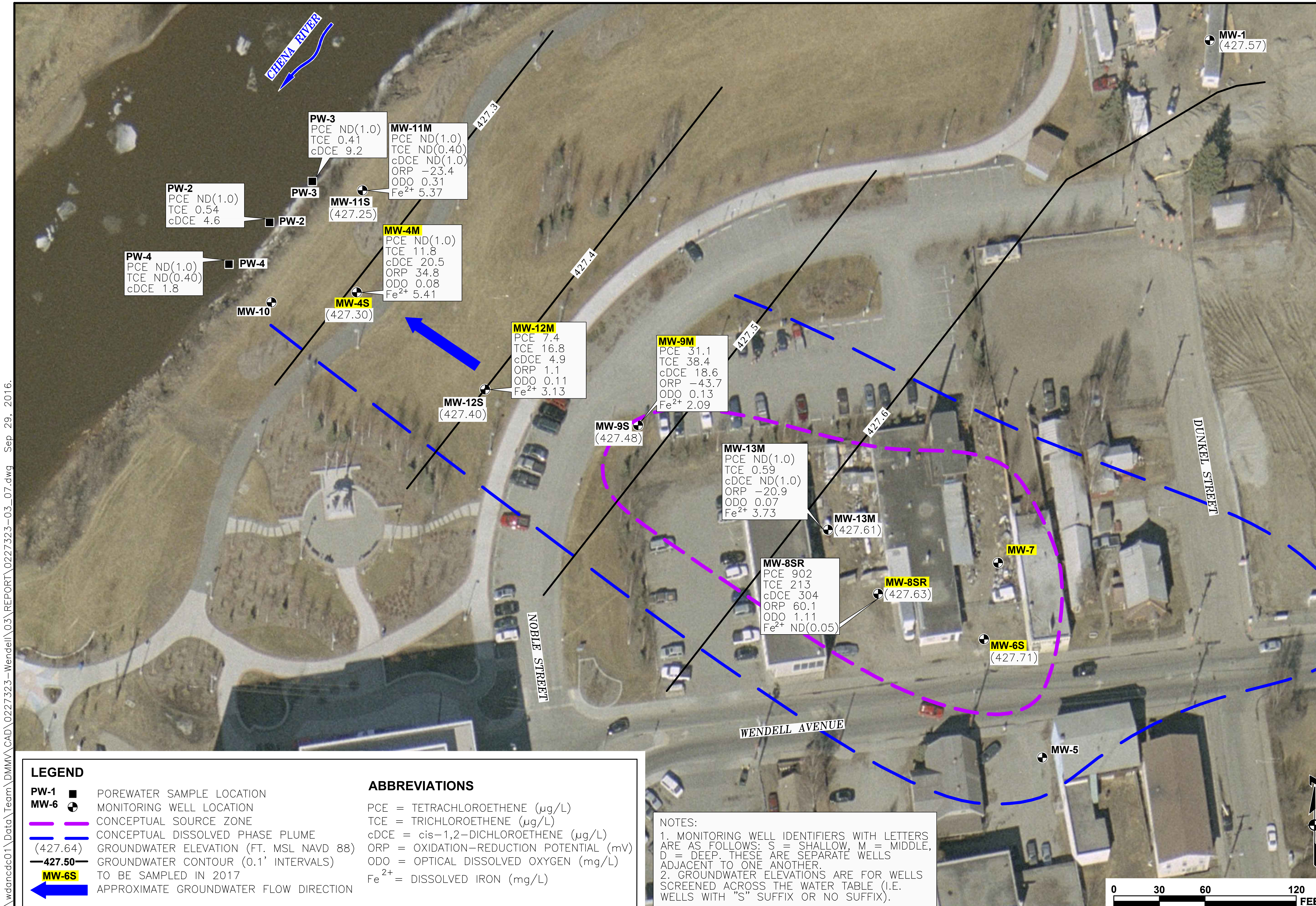


FIGURE 5

SFY 2017 PROPOSED GROUNDWATER MONITORING LOCATIONS WITH MARCH 2014 RESULTS AND ELEVATIONS

FY 2017 REMEDIATION AND MONITORING OF CHLORINATED SOLVENT AT 314 WENDELL WENDELL AVENUE SITE Fairbanks, Alaska

DATE: JUNE 2014
CHKD: C.T.B.
DRAWN: D.R.F
PROJ. No.: 0227323-3

ERM
825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

SOURCE: AERIAL PHOTO FT_WAIN4-25-07.TIF DATED 4/25/07 PROVIDED BY AERO-METRIC ANCHORAGE. SEWER LINE AS-BUILT OVERLAY PROVIDED BY GOLDEN HEART UTILITIES.

\\wdancdc01\Data\Team\DMMV\CAD\0227323-Wendell\03\REPORT\0227323-03_07.dwg Sep 29, 2016.

APPENDIX A

Wendell Avenue Conceptual Site Model

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APPENDIX B

SSD/SVE and OM&M Data Sheet

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Wendell Ave SVE/SSD System OM&M Data Sheet

Wendell Ave - SVE/SSD OM&M Data Sheet				
Date:	**Time:**	**Ambient Temp (^{0}F):**	**Technician:**	**Field Instrument Used/Last Calibrated:**

SSD System

Depressurization Wells						
Line	Vacuum (inWC)	Flow (scfm)	Valve % Open	Hex (ppm)	% CO2	%O2
DW-1	*<54*	*~10*				
DW-2	*<54*	*~10*				
DW-3	*<54*	*~10*				
DW-4	*<54*	*~10*				
DW-5	*<54*	*~10*				
DW-6	*<54*	*~10*				
Spare						
Spare						

SSD System Mechanical Parameters	
Dilution Valve % open	*Closed*
Knockout drum level	*Empty*
Manifold Vacuum (inWC)	*Max < 54 inWC*
Blower Vacuum (inWC)	*Δ < 10 inWC*
Exhaust Temp Digital (°F)	*< 215 °F*
Exhaust Temp Gauge (°F)	*< 215 °F*
Exhaust Flow (cfm)	*~60*
Filters Checked/Cleaned?	

Indoor Vapor Monitoring Points				
Point ID	Vacuum (inWC)	Hex (ppm)	% CO2	% O2
SS-4	*> 0.02*			
SS-5	*> 0.02*			
SS-8	*> 0.02*			

SVE System

Extraction Wells						
Line	Vacuum (inWC)	Flow (scfm)	Valve % Open	Hex (ppm)	% CO2	%O2
EW-1	*<81*	*~15*				
EW-2	*<81*	*~15*				
EW-3	*<81*	*~15*				
EW-4	*<81*	*~15*				
EW-5	*<81*	*~15*				
EW-6	*<81*	*~15*				
Spare						
Spare						

SVE System Mechanical Parameters	
Dilution Valve % open	*Closed*
Knockout drum level	*Empty*
Manifold Vacuum (inWC)	*Max < 81 inWC*
Blower Vacuum (inWC)	*Δ < 10 inWC*
Exhaust Temp Digital (°F)	*< 275 °F*
Exhaust Temp Gauge (°F)	*< 275 °F*
Exhaust Flow (cfm)	*~75*
Filters Checked/Cleaned?	

Outdoor Vapor Monitoring Points				
Point ID	Vacuum (inWC)	Hex (ppm)	%CO2	%O2
SG-2 @ 4' bgs	*> 0.1*			
SG-2 @ 8' bgs	*> 0.1*			
SG-3 @ 4' bgs	*> 0.1*			
SG-3 @ 8' bgs	*> 0.1*			
SG-7 @ 5' bgs	*> 0.1*			
SG-7 @ 9' bgs	*> 0.1*			
SG-8 @ 5' bgs	*> 0.1*			
SG-22 @ 8' bgs	*> 0.1*			
SG-24 @ 8' bgs	*> 0.1*			

At least one reading below 20.9%

Field Notes:

Additional Mechanical and Shared Elements

Control Room		
Parameter	**SSD**	**SVE System**
Motor Speed (Hz)		
IDEC Hourmeter Reading/Time		
Hobbs Hourmeter Reading/Time		
Previous IDEC Hourmeter Reading/Date/Time		
Previous Hobbs Hourmeter Reading/Date/Time		
Total Hours Since Last Event IDEC/Hobbs		
Percent Operability		

Exhaust Stack/Heat Trace	
Exhaust Stack Drained?	
Exhaust Stack (Hex (ppm), %O2, %CO2)	
Exhaust Stack Colortec (ppm)	
Heat Trace On?	
LEL Monitor Reading (%LEL)	
GVEA Meter Reading (kW-hr)	

Laboratory Sample	
Effluent Sample ID	
Summa Canister ID	
Time/Date	
Initial Vacuum ("Hg)	
Final Vacuum ("Hg)	

Field Notes:

Itemized values are the operational target for this monitoring parameter. Observed values should be entered and compared to the target values to determine if operational adjustement or maintenance is required

NR = not recorded

##/## = "/" between readings indicates guage reading "before" and "after" adjustment

SG-1 destroyed: SS-6, SS-7, SS-9, SS-10, SS-11, SS-12, SS-13 no longer safely accessible due to building condition

APPENDIX C

Cox-Colvin Vapor Pin Standard Operating Procedure, EPA Low-Flow Groundwater Sampling Procedures, and Color-Tec Screening Manual

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APPENDIX D

Building Survey Form

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ALASKA DEPARTMENT OF ENVIRONMENAL CONSERVATION
BUILDING INVENTORY AND INDOOR AIR SAMPLING QUESTIONNAIRE

This form should be prepared by a person familiar with indoor air assessments with assistance from a person knowledgeable about the building. Complete this form for each building where interior samples (e.g., indoor air, crawl space, or subslab soil gas samples) will be collected. Section I of this form should be used to assist in choosing an investigative strategy during workplan development. Section II should be used to assist in identification of complicating factors during a presampling building walk-through.

Preparer's Name ______________________________ Date/Time Prepared ____________________

Preparer's Affiliation ______________________________ Phone No. ____________________

Purpose of Investigation ____

SECTION I: BUILDING INVENTORY

1. OCCUPANT OR BUILDING PERSONNEL:

Interviewed: Y / N

Last Name ____________________ First Name ____________________

Address ____

City ____

Phone No. ____

Number of Occupants/people at this location ____________ Age of Occupants ____________

2. OWNER or LANDLORD: (Check if same as occupant ____.)

Interviewed: Y / N

Last Name ____________________ First Name ____________________

Address ____

City ____

Phone No. ____

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response.)

Residential	School	Commercial/Multi-use
Industrial	Church	Other ____________________

If the property is residential, what type? (Circle appropriate response.)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouse/Condo
Modular	Log Home	Other______________________

If multiple units, how many?____________________

If the property is commercial, what type?

Business types(s)____

Does it include residences (i.e., multi-use)? Y / N   If yes, how many?______________________

Other characteristics:

Number of floors______________________   Building age__________________________

Is the building insulated? Y / N   How airtight? Tight / Average / Not Tight

Have occupants noticed chemical odors in the building?   Y / N

If yes, please describe:____

____

4. AIRFLOW

Use air current tubes, tracer smoke, or knowledge about the building to evaluate airflow patterns and qualitatively describe:

Airflow between floors

____

____

____

Airflow in building near suspected source

____

____

____

Outdoor air infiltration

____

____

____

Infiltration into air ducts

____

____

____

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply.)

a. Above-grade construction: wood frame | log | concrete | brick

constructed on pilings with enclosed air space | constructed on pilings with open air space

b. Basement type: full | crawlspace | slab-on-grade | other______________________________

c. Basement floor: concrete | dirt | stone | other ______________________________

d. Basement floor: unsealed | sealed | sealed with______________________________________

e. Foundation walls: poured | block | stone | other ______________________________

f. Foundation walls: unsealed | sealed | sealed with _____________________________________

g. The basement is: wet | damp | dry

h. The basement is: finished | unfinished | partially finished

i. Sump present? Y / N

j. Water in sump? Y / N / not applicable

Basement or lowest level depth below grade__________________________(feet).

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, and drains).

____

____

6. **HEATING, VENTING, and AIR CONDITIONING** (Circle all that apply.)

Type of heating system(s) used in this building: (Circle all that apply – not just primary.)

Hot air circulation	Heat pump	Hot water baseboard	
Space heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other__________________________

The primary type of fuel used is:

Natural gas	Fuel oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank is fueled by:____

Boiler/furnace is located in: Basement | Outdoors | Main floor | Other___________________

Do any of the heating appliances have cold-air intakes? Y / N

Type of air conditioning or ventilation used in this building:

Central air	Window units	Open windows	None
Commercial HVAC	Heat-recovery system	Passive air system	

Are there air distribution ducts present? Y / N

Describe the ventilation system in the building, its condition where visible, and the tightness of duct joints. Indicate the location of air supply and exhaust points on the floor plan.

____

____

____

____

Is there a radon mitigation system for the building/structure? Y / N Date of Installation________________________

Is the system active or passive? Active/Passive

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost never

Level	**General Use of Each Floor (e.g., family room, bedroom, laundry, workshop, or storage).**
Basement	____________________
1st Floor	____________________
2nd Floor	____________________
3rd Floor	____________________

8. WATER AND SEWAGE

Water supply:	Public water	Drilled well	Driven well	Dug well	Other__________________
Sewage disposal:	Public sewer	Septic tank	Leach field	Dry well	Other__________________

9. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note that.

Basement:

First Floor:

10. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (e.g., industries, gas stations, repair shops, landfills, etc.), outdoor air sampling locations and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the location of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

SECTION II: INDOOR AIR SAMPLING QUESTIONNAIRE

This section should be completed during a presampling walk-through. If indoor air sources of COCs are identified and removed, consider ventilating the building prior to sampling. However, ventilation and heating systems should be operating normally for 24 hours prior to sampling.

a) 1. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

Is there an attached garage? Y / N

Does the garage have a separate heating unit? Y / N / NA

Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, ATV, or car) Y / N /NA

Please specify______________________________________

Has the building ever had a fire? Y / N When?___________________________________

Is a kerosene or unvented gas space heater present? Y / N Where?___________________________________

Is there a workshop or hobby/craft area? Y / N Where and type______________________________

Is there smoking in the building? Y / N How frequently?_____________________________

Has painting/staining been done in the last six months? Y / N Where and when?____________________________

Is there new carpet, drapes or other textiles? Y / N Where and when?____________________________

Is there a kitchen exhaust fan? Y / N If yes, where is it vented?_____________________

Is there a bathroom exhaust fan? Y / N If yes, where is it vented?_____________________

Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

Are cleaning products, cosmetic products, or pesticides used that could interfere with indoor air sampling? Y / N

If yes, please describe____

____

____

Do any of the building occupants use solvents at work? Y / N

(For example, is the building used for chemical manufacturing or a laboratory, auto mechanic or auto body shop, painting shop, fuel oil delivery area, or do any of the occupants work as a boiler mechanic, pesticide applicator, or cosmetologist?)

If yes, what types of solvents are used?____

If yes, are his/her/their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry cleaning regularly (weekly) No

Yes, use dry cleaning infrequently (monthly or less) Unknown

Yes, work at a dry cleaning services

2. PRODUCT INVENTORY FORM (For use during building walk-through.)

Make and model of field instrument used:____

List specific products found in the residence that have the potential to affect indoor air quality:

Location	Product Description	Site (units)	Condition[1]	Chemical Ingredients	Field Instrument Reading (units)	Photo[2] Y / N

[1] Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**.

[2] Photographs of the front and back of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

This form was modified from:
ITRC (Interstate Technology and Regulatory Council). 2007. *Vapor Intrusion Pathway: A Practical Guideline*. VI-1. Washington, D.C.: Interstate Technology and Regulatory Council, Vapor Intrusion Team. Available at: www.itrcweb.org.

The Alaska Department of Environmental Conservation's Contaminated Sites Program protects human health and the environment by managing the cleanup of contaminated soil and groundwater in Alaska.For more information, please contact our staff at the Contaminated Sites Program closest to you:
Juneau: 907-465-5390 / Anchorage: 907-269-7503
Fairbanks: 907-451-2153 / Kenai: 907-262-5210

APPENDIX E

Subsurface Clearance

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